THE AMERICAN JOURNAL OF UROLOGY

VOL. II. SEPTEMBER, 1906. NO. 12

SURGERY OF THE URETER.[1]

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IN approaching this subject it is well first of all to consider for a moment the physiological function of the ureter. Its purpose is so obvious that the most elementary student has never to ask his instructor its use, and it is, perhaps, on that account that this important organ has, as a rule, received so little general attention. In thinking, however, of its prominent function when one considers its length, its narrow lumen, and the grave constitutional disturbances which immediately follow any stoppage of the urinary flow along its course, it is then easy to become impressed with its importance, and even, perhaps, to err in the belief of attributing to its disorganization more than its true quota of urological disturbances.

It is chiefly to cystoscopy, and in a minor though somewhat important degree to skiascopy, as diagnostic aids that the profession is indebted for making possible of accomplishment much which is now being done in this branch of surgery.

It has seemed well in treating this subject to sub-divide it under two headings, the first, to be devoted to the surgical uses to which the ureter is put in the diagnosis and management of disease in the kidney and its pelvis, and the second, to consider the diseases and lesions of the ureter itself together with their surgical management.

The first of these headings will be considered briefly. Some may even object to any consideration of this special subject in a paper with the above title, still, as catheterization of the ureter, or more exactly the ability to accomplish it, is the foundation as it were on which is based so much that has been accomplished in this surgical branch, it has seemed proper to give it attention.

[1] Read before the American Urological Association, New York, April 3, 1906.

The pioneer work of Pawlik and Kelley on the female ureter, employing the endoscopic principle and reflected light, doubtless did much to stimulate surgical attention in this direction. One great objection, however, to the work of these authorities was that their method could be made applicable only to the female. In the early Nitze and Leiter cystoscopes the lamps were so hot that the bladder wall was cauterized unless great care was observed, and it was only after the advent of the cold lamp that a systematic study of the ureteral orifices could be attempted. Then it was that Nitze solved the problem of ureteral catheterization by the aid of reflected light, the indirect method, and Tilden Brown by the aid of non-reflected light, the direct method. Both these methods of procedure are satisfactory and practical. A surgeon who has, however, rendered himself expert with one of them is not apt to be an adept with the other, and it seems hardly worth while to perfect oneself in both methods. Before attempting to catheterize ureters the surgeon should first accustom himself to the manipulation of the cystoscope proper and to the study of intravesical appearances. He should next practice finding and locating the ureteral orifices without attempting to pass a catheter. After he has perfected himself in these particulars, the last step in the study, the actual passage of the catheter ought not in the great majority of instances to present any special difficulties. If, on the other hand, one attempts to become skilled at ureteral catheterization without the preliminary study recommended he will be doomed to failure.

From a diagnostic standpoint catheterization of the ureters is in the great majority of instances undertaken for the purpose of collecting separately the urine from each kidney. The advantages gained by such a procedure are almost too obvious to require detailing. There is no longer any excuse for a surgeon, should he have removed the wrong kidney, the only kidney, or one damaged kidney in a case where the remaining kidney was also so damaged as to be unable of itself to support life. It may be also that catheterization of a ureter aside from renal urinary segregation may furnish important diagnostic data. Thus in cases of hydro or pyo-nephrosis from the volume of the fluid drained directly from the renal pelvis the degree of distension and renal disorganization can be reckoned. Occasionally also the tip of a catheter or sound, especially if it be waxed as Kelly

has recommended, may be able to detect stone even in the renal pelvis. Catheterization of the ureter undertaken for the purpose of lavage of the renal pelvis in cases of pyelitis has at the hands of Ayres and a few others accomplished marked results. Where pyelitis exists as the result of defective drainage conditions this form of treatment must, of course, be only palliative, just as is washing the bladder for a cystitis of a similar description, the radical treatment being a removal through surgical operation of the condition causing the defect in drainage. One other purpose to which ureteral catheterization is sometimes put is to divert the urine temporarily from the bladder after a vesical operation. The most striking instance of the value of this procedure of which I have cognizance was in connection with a case of exstrophy of the bladder reported by Guiteras, wherein the urine was in this manner diverted from the bladder until healing by first intention had occurred in connection with the plastic flaps formed to make an anterior wall for the bladder.

Diseases of the ureter rarely manifest themselves clinically unless they serve as a cause for interference with the functions of the organ, that is, unless they cause an obstruction to urinary flow. Physiological experiments have shown that atrophy of the kidney follows complete and permanent obstruction of the ureter, whereas hydronephrosis results from a chronic narrowing of the canal, especially where such a narrowing has developed slowly, and also from an intermittently recurring obstruction. From a surgical clinical standpoint ureteral diseases can be classed under two divisions, first, obstructions to the lumen of the canal by calculous formations, and second, obstructions to the lumen dependent on diseased conditions of the organ itself. Under the first classification are grouped a majority of cases. In this majority, with very few exceptions, the ureter itself is primarily normal, the cause being the calculus, while the resulting clinical symptoms depend largely on the size and contour of the stone and on the degree of its progression along the canal. Diseased conditions affecting the organ itself and causing obstruction are acute flexions, torsions, traumatisms, neoplasms, and infections. There is another pathological condition which, although profoundly affecting the ureter, does not give rise to surgical symptoms in connection with that organ, and that is the existence of chronic obstruction to vesical drainage. Such obstruction often

results in a marked dilatation of the ureter, thus allowing urinary reflux and an ascending infection of the kidney and its pelvis.

Stone in connection with the ureter is of special surgical interest only when it effects a lodgment in the canal. The most acute and agonizing symptoms are, of course, associated with a stone which has not become so lodged, those symptoms ceasing immediately on the exit of the stone into the bladder. The surgeon, however, in these latter cases has little to do aside from the administration of anodynes to enable the patient the better to withstand the ordeal. Where, however, a stone has become lodged the question is different. Then it is that the surgeon has to make his diagnosis, locate the position of the calculus, and lastly, accomplish its removal. Clinical symptoms and the examination of the urine, of course, direct the surgeon's attention to the urinary tract, while cystoscopic examination of the bladder eliminates that organ from consideration. Sometimes the observation cystoscope, by allowing an inspection of the ureteral orifice, may reveal a calculus protruding to a greater or less degree from that opening, or if the calculus be lodged just above the orifice such lodgment may cause the opening to appear unduly patulous. The next step in a diagnostic procedure is to pass a ureteral catheter or bougie. In many instances it may be impossible to pass by the calculus, the tip of the instrument bringing up firmly against it. Here it is that the wax-tipped bougie is of much diagnostic value, the impact on the stone leaving characteristic scratches. Many times, however, a bougie may slip by a calculus and enter the renal pelvis. It is in such cases that the skiagraph is of supreme importance, and in order to make doubly sure that the shadow in the picture is cast by a stone in the ureter itself Brown has initiated the practice of having the skiagraph taken subsequent to the passage of the ureteral bougie. By this arrangement the tract of the ureter in the picture is definitely determined, and consequently if a stone is lodged in the canal its shadow will lie close to the line which marks the course of the ureteral bougie, thus eliminating all doubt. For otherwise it might be open to argument whether a shadow cast by a ureteral stone, for instance, could not have been made by some bowel concretion. A few instances have been reported wherein the passage of a ureteral catheter or bougie has of itself served to

so dislodge a stone from its ureteral resting place that a spontaneous cure has followed through a natural elimination of the calculus. In most instances, however, where by the means mentioned a positive diagnosis of calculus lodged in the ureter has been made, operative surgery for its direct extraction is next called for. If a calculus is lodged at or just behind the uretero-vesical opening it is then advisable to perform a supra-pubic cystotomy, seize it with forceps or encompass it with a scoup, divulse the opening if needs be and extract it by direct traction. In order to steady such a stone while an attempt is being made to grapple it with instruments rectal or in the female vaginal digital counter pressure may be of aid. In a few instances in the female stone in this position has been extracted through a vaginal incision. Where the skiagraph shows a stone lodged at or just within the uretero-pelvic orifice nephrotomy should be performed, the renal pelvis opened and the stone seized and extracted in practically the same manner as just described in connection with supra-pubic cystotomy. Where a stone is lodged in the course of the canal at a distance from either orifice an extra-peritoneal incision has to be made, exposing the course of ureter, and in such a case the surgeon should try, before opening the ureter, by a stripping manipulation to force along the calculus if it be not manifestly too large, or by such manipulation to disintegrate it in case it should happen to be very soft and friable. Where these expedients fail the next step in case the kidney is not also disorganized is to open the ureter at the site of the impaction sufficiently to allow the direct extraction of the calculus. Such an incision should be made carefully and parallel to the course of the canal, so that no contracting cicatrix may be left to cause a stricture of the lumen of the organ. To close such an incision fine chromocized catgut is preferable, care being taken not to pierce the mucous surface, thus exposing the catgut to urinary action, lest calculous deposit may there form. In order to make sure of preserving the lumen of the canal while the sutures are being taken it may be well to have a bougie in the ureter. To guard against damage from some urinary leakage at the site of the ureteral opening a wick or gauze drainage should connect that part with the surface of the body through an otherwise closed wound. In cases, of course, where the associated kidney is

greatly disorganized such conservative ureteral surgery may not be wise, a better course, perhaps, being the removal of the kidney, together with the ureter, at a point below the lodgment of the calculus.

Acute flexions and torsions of the ureter are caused by a floating or moveable condition of the kidney. Their correction is consequently a matter of renal rather than of ureteral surgery. In this connection it can be said, however, that nephropexy in case the kidney has not already become disorganized and the fixing of the organ in its proper position effects a cure of the resulting ureteral disorder.

Moderate torsions and flexions of the ureter, especially where the secondary element of infection is superadded, are among the causes of stricture of the part. Traumatisms and infections, either singly or combined, are other causes for a like condition. Neoplasms can also cause obstruction through an involvment of the wall of the canal or from the outside pressure they may exert. Such conditions of the ureter are diagnosed and studied as are corresponding lesions of the urethra by sounds and bougies. One can, of course, manipulate the urethra much more thoroughly than he can the ureter. If the standard sized bougie or catheter cannot be made to pass a ureteral obstruction the surgeon has to desist, contenting himself by locating the obstruction, reckoning the distance the instrument passes up the canal. Sometimes by careful manipulation a stricture can be passed, and in such cases it may then be that much benefit will follow the regulated passage of a bougie and the gradual dilatation of the part. Aside from the actual passage of an instrument much diagnostic information may be gained in many of these conditions from a careful cystoscopic study of the ureteral orifice. Where the ureter is completely obliterated atrophic changes generally occur, so it may be that no trace at all of the orifice is preserved, or perhaps a little shallow sulcus may persist. It is rare, however, in such instances to be able to make the tip of a catheter enter any distance along the canal. In partial obstructions the so often associated element of infection is apt to lend an edematous, or more or less inflammatory appearance, to tissues surrounding the vesical orifice. Besides this, just as in renal pelvic inflammations, if the surgeon watches such an orifice

he is likely to see the swirl of purulent material as it is ejected into the bladder.

The surgical treatment of these lesions causing ureteral obstruction may be palliative, it may consist in the removal of the involved organ and its kidney, or it may attempt a direct repair of the lesion. Palliative treatment may be advisable and generally is in cases where the element of infection alone or combined with another cause accounts in large degree for existing symptoms. The gonococcus, the streptococcus, and the tubercle bacillus, either alone or combined, are the usual agents of infection. Of the resulting lesions those from tubercle are apt to be the most severe. Palliative treatment consists chiefly of diuresis, the administration by mouth of drugs tending to sterilize the urine or eliminate the infection, and in some cases topical treatment through ureteral lavage. Where ureteral obstruction is of a severe grade, and is caused by a lesion which involves either a considerable length of the ureter, or two or more separate portions of the canal, so that a repair of the obstruction is out of the question, then it is that a nephrectomy is demanded to put the diseased ureter out of commission. Besides the nephrectomy it is also generally advisable to remove the diseased ureter, especially in cases where its walls are thickened by inflammatory action or its canal much overdistended, lest a troublesome sinus should persist at the seat of operation. The surgeon should attempt to accomplish a cure by repairing the lesion in cases where the ureteral obstruction is localized in one small area of the canal, the rest of the part being in a fairly healthy condition and where there is no coexisting advanced lesion in connection with the kidney and its pelvis.

Credit for such an operation belongs in large degree to the late Dr. Fenger, who cured a case of valvular obstruction at the pelvic opening of the ureter by its adoption. The operation consists in first making a longitudinal incision into the ureter, laying open the canal. The upper part of the incision lies above the seat of the obstruction and the lower termination of it extends below it. A suture is then put into the ureter so as to draw together the upper and lower ends of the cut, thus shortening the canal and at the same time widening its calibre at the spot where it is contracted. Side sutures are next put in, permanently closing the looped together edges to the lateral incisions.

Van Hook's splicing operation can sometimes be made to apply in this connection. The first mentioned procedure is, however, preferable.

In the performance of abdominal operations, or as the result of penetrating wounds or injuries, the ureter is occasionally cut completely across. If it is severed very close to its renal pelvic, or to its vesical termination, it may be that the main trunk can be grafted directly into the pelvis or into the bladder, as the case may be. Where such is not the case, however, the only reparative procedure available is that of Van Hook's, the splicing together of the severed ends. Failing in these devices it remains in such a contingency to remove the kidney or to establish a renal surface, or possibly a bowel fistula, both disagreeable alternatives.

Sometimes, as in cases of exstrophy of the bladder or malignancy, the attempt has seemed advisable to divert the urine from the bladder, this being accomplished by grafting the ureteral ends into the rectum. In most such attempts ascending infection of the kidneys has resulted. It has been claimed, however, that such renal infection will not ensue, provided the bladder wall about the ureteral orifice is taken away in the grafting process so that the vesico-ureteral valve is left intact.

In conclusion it has seemed well to mention the tolerance shown by the ureter to catheterization. The passage of a catheter along the ureter, if carefully done, causes little of no pain. The complaint, if any, which a patient makes in connection with the procedure arises from the urethral sensations due to the movements of the cystoscope. If the urethra is narrow or inflamed the cystoscope causes discomfort, and perhaps actual pain. Asepsis should be observed in this as in all surgical procedures. In my experience, however, there is less danger of provoking an inflammatory reaction from ureteral than from urethral instrumentation. I have seen but one instance wherein a very severe reaction seemed to follow urethral catheterization, and that occurred in connection with a case suffering from a tubercular involvment of the kidney and the ureter. The catheterization seemed here to account for an acute exacerbation of the existing infection, dangerous symptoms developing. In most cases no apparent reaction follows.

To become skilled in ureteral catherization requires much practice. From personal experience I should say that one should

catheterize the ureters in at least fifty cases before much real aptitude is developed. After one has, however, performed the act several hundred times he begins to wonder why the procedure is considered difficult, for then it is that the catheter seems to enter the canal promptly and almost of its own accord, whereas in the first attempts very likely after a tedious half hour's trial the ureteral orifice had not been even found, while the tip of the catheter had been so bent in vain efforts as to have ruined the instrument.

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THE SYMPTOMATOLOGY OF URETERAL DISEASES.[1]

By Douglas H. Stewart, M. D., New York.

IT is generally admitted that the ureters are almost immune from diseases of their own and consequently ureteritis is always a complication of some trouble above, or below, or outside of them. Probably this immunity is explained in great part by their position, their excellent drainage and by their being flushed by a sterile fluid under normal conditions, which drainage and flushing will be interfered with by the bending of the ureteral tube as in movable or floating kidney; by distortion and more or less occlusion resulting from the pressure of an abdominal neoplasm and by an internal stricture resulting from prolonged inflammation or internal traumatism, such as the passage of a rough stone.

Serious injury from external traumatism is so well known that Dr. Kelly directs that the first step, in his operation for the removal of the womb and appendages, should be the introduction of catheters into the ureters in order to render them more distinct and thus enable the operator to avoid harming them during the progress of surgical procedures. Dilatation follows obstruction here as elsewhere, and it would be more marked were it not for the physiological fact that when the urinary pressure in the pelvis of the kidney equals the blood pressure in the renal substance, then excretion ceases and naturally if the ureteral pressure be artificially raised beyond a certain point the whole mechanism of the kidney is reversed and absorption takes place. If you will consider the

[1] Opening discussion at the meeting of the American Urological Association, held in New York City, April 3, 1906.

anatomical relations of kidney and ureter it will be evident that the ureters, schematically, are good air pumps, and that the excretion of urine is practically carried on from the high blood pressure in the kidney to the minus pressure created by the force of gravity and the peristaltic contractions of the muscular walls of the ureter. As might be anticipated the ureter conveys the most urine when the kidney contains the most blood, and it seems quite reasonable in theory to suppose that should a ureteral obstruction be sufficient to raise the urinary pressure in the renal pelvis above the blood pressure in the renal substance, then the renal mechanism would be overthrown.

One of the most remarkable features of the ureter is its peristalsis, and I have not the least idea of its cause. Research has failed to enlighten me. This much I do know; contractions go on in a piece of the ureter removed from all attachments and conveying no urine.

It is true that contractions are more marked when the ureter is exercising its natural functions; but neither nervous influence nor the passage of urine cause peristalsis: although they do stimulate it.

Inflammation of the ureter is practically always a complication, therefore the symptoms are marked to such an extent, that while the original disease may be quite plain to the general practitioner, ureteritis only exceptionally receives the consideration it merits. Hence a clear opinion can be formed on the passage of renal calculi with scarce a thought on the laceration produced thereby. A cystitis may be diagnosed without any consideration of the possibilities of an ascending ureteritis: or an abdominal tumor or misplaced kidney may be defined with little heed given to the effect on the ureter. I may perhaps truly say that even a urologist may discover a ureteritis more often because he is thorough and wishes to examine every part of the genito-urinary tract, than because he had any preconceived idea of its existence and was searching for it. The expert microscopist is most favorably situated because he has no baffling mixture of symptoms to consider, but describes what he finds in the urine solely: hence the immense advantage of the cystoscope and microscope going hand in hand.

Broadly speaking, I would suggest as a working symptomatic basis, that if a patient has just passed, or is passing renal calculi—

we can take the ureteritis for granted. If he has a cystitis of any duration or an abdominal tumor, then an expert microscopical examination of the urine for ureteral inflammation is invaluable.

The most common symptom is pain, and this pain is peculiar in that it is radiated downward to the bladder, or even to the testicle. Tenderness is often found along the ureter, so that its course may be made out by palpation.

A very good routine question to incorporate in a history is "Have you noticed any difference in the quantity of your urine?" Should the answer be "No," then it is a fair inference that the ureteritis has extended from below upward. Should the answer be "Yes; it is sometimes very little and at others a lot," then the inference is equally fair as to extension from above downward; because in an inflammation pure and unobstructive, practically no change is to be expected in the quantity of urine; but in case of obstruction, by calculi for instance, we would find the flow diminished or very variable as in hydronephrosis. And should we get tenderness along the ureter with no history of calculi, that tenderness points strongly to a ureteritis of gonorrheal or septic origin. Perhaps I am partial to this symptom because I once received a great deal of credit through it.

An excellent physician, one of the fine minds of the profession, asked me to look after a patient for him. The diagnosis was hydronephrosis in a boy aged nineteen. Prognosis; grave. In order that I might have a clear idea of affairs, and know what to do should an emergency arise during the night, the doctor asked me to accompany him and make a careful examination. I found a slightly enlarged right kidney, and tenderness along the ureter. Palpation was easy as the patient was very thin. Inquiry revealed that the quantity of urine passed did not vary materially: examination showed a urethral discharge: the residuum of a gonorrhoea of two years before. The patient was transferred to a hospital where he died a few days later. Autopsy revealed about as much damage as gonorrhoea could produce in the urinary tract.

While not infallible, the symptom is valuable. For emphasis I repeat: Tenderness along the ureter with no variation in amount of urine, justifies search for evidences of specific ureteritis.

Differentiation between a right-sided ureteritis and appendicitis may be difficult. The pain of appendicitis is likely to appear anywhere and follow most any sort of a course on oc-

casions. Palpation usually reveals rigidity of the right rectus abdominalis and flexion of the right thigh upon the abdomen is very uncomfortable in appendicitis; while the muscle rigidity is lacking and the flexion does not incommode in ureteritis.

The symptoms of ureteral diseases are important, but often obscure. In their discernment and interpretation, success may only be hoped for from the united efforts of the urologist, the general practitioner and the skilled microscopist.

URETERAL LAVAGE.

By Winfield Ayres, New York.

LAVAGE in the treatment of inflammation of the ureter has decided limitations. Without an associated pyelitis or nephritis, ureteritis is rather rare, its origin being then commonly due to a local condition such as impacted calculus, kinking, or stricture of the ureter. It is possible to have tuberculosis of the ureter without other involvement of the urinary tract, yet one would scarcely expect to obtain satisfactory results in these cases from lavage; or if benefit were derived therefrom, one would doubt the diagnosis. Acute inflammation of the ureter is a contraindication to the passage of the ureteral catheter.

In one condition only is lavage of the ureter indicated as soon as diagnosis is made. I refer to stricture of the ureter. Inflammation cannot be eradicated until the stricture is fully dilated, but if the ureter be thoroughly washed after each dilatation, amendment will more quickly follow. In all other cases lavage should be employed only after the proven failure of internal medication, etc.

Calculous ureteritis usually disappears after the stone has been dislodged, yet if it persist may be treated by lavage. Occasionally it is possible to induce a small calculous to leave its niche in the ureter and pass into the bladder by injecting sterilized vaseline above and about it through a full-sized ureteral catheter. As an ordinary thing, however, an ureterotomy is necessitated.

Ureteritis due to kinking of the ureter, can be cured by lavage, but a return of inflammation may be expected unless nephropexie be performed. Commonly, the only essential to overcoming inflammation, is fixation of the kidney, and therefore as a rule lavage is unneeded.

Conclusively then, the only cases of ureteritis benefited by lavage are those occasioned by stricture, idiopathic ureteritis and ureteritis associated with pyelitis.

Diagnosis of ureteritis without pyelitis or nephritis may be made on microscope testimony, but clinical diagnosis is much easier and should always be employed in corroboration. Pus may have been seen issuing from the ureteral meatus, or perhaps its appearance may have prompted suspicion of trouble in the ureter; an ureteral catheter is inserted a short distance collecting cloudy urine; is passed further into the ureter and again secures urine. In this manner the entire length of the ureter is tested. If from some point high up along the ureter or from the renal pelvis, clear urine be obtained, clinical diagnosis of ureteritis without pyelitis is manifest. One possible exception to this rule exists: the extremely rare condition of a double ureter on one side with a single opening in the bladder—one ureter and its pelvis being involved, the other not. The catheter below the point of union of the two ureters might gather urine from both, and yet proceeding further might enter the normal branch and there collect clear urine. This condition must be excessively uncommon, but I am led to speak of it because I believe I have such an one under observation at present. I shall report his case more fully later. If the amount of pus in the urine collected in the lower portion of the ureter be out of ratio to that which would be found in an ureteritis, and the urine from the renal pelvis be clear, the above condition must be taken into consideration no less than the possibility of an abscess cavity communicating with the ureter.

Lavage for inflammation of the ureter should be employed only after the asserted inefficiency of internal medication, etc. No benefit may be expected, however, unless the operator be thoroughly trained in technique. Lavage will not remedy all cases, but before resorting to operation, it is well to first attempt cure through that agency. In two or three weeks signs of benefit or non-influence are readily detected and the patient being constantly under observation, an operation may be performed at any time.

Method of lavage. The catheter is passed slowly and gently beyond the area of inflammation or, if there be ureteropyelitis, well into the renal pelvis. The cystoscope is removed and unless a sample of urine be desired, the patient is ready for treatment. Primarily, very small amounts should be urged

through the catheter until the ureter becomes accustomed to the foreign fluid. The initial injection should be not more than 2 cc. —this being allowed to flow out. The second injection may be 3 cc., but during the first lavage it is best not to inject at any time more than 5 cc. When about 60 cc. of the solution has been used, the catheter is withdrawn 10 cm. and lavage repeated, and so on until the entire ureter has been thoroughly washed. In nearly all subjects there is a return flow along the catheter, as the fluid is introduced, in so much that quite a large injection may be given without causing the patient any discomfort, but in occasional instances very little return flow is noticeable, and it is in apprehension of similar cases that the first few injections must be made carefully and gently; otherwise, severe renal colic may ensue. At first also very mild solutions should be used or a colic may occur several hours after treatment. In all cases the bladder and urethra must be washed out after the ureteral catheters have been withdrawn; the bladder in order to remove all products cleansed from the ureter and the urethra as a precaution against urethral chill.

After the first treatment, the patient should be required to continue in a recumbent position without constriction about the waist from thirty to sixty minutes. Being then allowed to go home, he should previously be warned to remain perfectly quiet for the balance of the day. After several lavages these precautions are not necessary, and he may be permitted to do as he pleases directly after treatment. In the event of a renal colic, the patient should be directed to apply hot water over the kidney. Under this suasion, pain usually ceases in ten or fifteen minutes.

I prefer to use the direct view cystoscope for inserting catheters, because with it, the time occupied in operation is much less and the instrument may be removed without disturbing the position of the catheters. The bladder may be washed out through the cystoscope, thus avoiding the passage of an extra instrument. It must be admitted, however, that in isolated cases, impossible of catheterization by the direct method, the indirect must be employed.

Drugs to be used should be selected to suit each case. For catarrhal inflammations, I have found silver nitrate in a boric acid medium the best. Its strength should vary from 1:8000 primarily, to 1:3000 as the patient becomes accustomed to it. I

have not proved it necessary to employ a stronger solution in this class of cases, and I rarely use a stronger than 1:4000. For purulent inflammations of the ureter and renal pelvis, when there is good drainage, I have found freshly dissolved argyrol (15%) excellent, but when the solution is retained for some time, it decomposes and irritates. Colargolum, from 1:2000 to 1:100, is sometimes efficient. Silbermine 1 to 3%, is another drug whose usefulness I have confirmed. A saturate solution of boric acid, however, will often clear the urine better than any of the above named. This must be used very copiously, but only in those cases which allow a free return outside the catheter. When administering boric acid, I attach the catheter to a percolator and regulate the current by hydrostatic pressure, about a litre being allowed to flow through the catheter.

Frequency of treatment depends upon the case under observation and tolerance of the bladder and urethra to the use of the cystoscope. Catarrhal ureteropyelitis does not require lavage oftener than once in five days. Purulent ureteritis or ureteropyelitis must be treated at shorter intervals—every second day if possible. I have had several patients undergoing lavage every second day for two or three months without any occasioned irritation of the bladder or urethra. Catheters may be left in the ureters for several days, the renal pelves and ureters being frequently washed meanwhile. In cases of ureteritis, this would be of benefit only when there is a free return flow. Just as soon as the catheters become eroded or plugged they should be removed and new ones inserted.

For treatment of the ureter alone lavage is indisputably limited in usefulness.

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DISCUSSION.

Dr. Louis Heitzmann. Even at the present day most clinical pathologists consider it impossible to diagnose epithelia from different parts of the urinary tract, by the microscopical examination of urine; nevertheless, there can be no doubt that such a diagnosis can not only be made, but is not at all difficult in the majority of cases. The different genito-urinary organs are lined by epithelia which are more or less characteristic, and in pathological conditions these epithelia appear in the urine in varying numbers. Since the advent of the ureteral catheter, the subject has been simplified to a considerable degree, as the epithelia from the lower tract can be positively excluded, and only those from the uriniferous tubules, pelvis of the kidney

and ureter, with perhaps an occasional epithelium from the superficial layers of the bladder, will be found in urine obtained by means of the ureteral catheter. In order to understand the ureteral epithelia as seen in urine, a general idea of epithelia is necessary, as it is impossible to diagnose them without a fair knowledge of histology. There are only three varieties of epithelia in the body, the flat or squamous, the cuboidal, and the columnar or cylindrical, so that their shapes alone do not help us in the diagnosis; the sizes, however, are characteristic enough in the majority of cases. The ureter is composed of a number of layers of epithelia, that is, has stratified epithelium. If we make a transverse section of a ureter, we will see that it contains five, six or more layers of small, slightly irregular, cubodial, with one, the deepest layer of columnar epithelia. These formations are distinctly different from those seen in the different portions of the uriniferous tubules or those seen in the pelvis of the kidney, being larger than the former, but smaller than the latter. On examining a urine, and looking for similar epithelia, we will have little difficulty in recognizing them. The only organ of the genito-urinary tract which is frequently lined by cuboidal epithelia of the same size, is the prostate gland, but here columnar epithelia from the ducts of the gland, distinctly different from those seen in the ureter, are always associated with the cuboidal epithelia. In a ureteral catheter specimen no formations are ever present, which at all resemble the epithelia from the ureter, and they can be located with absolute positiveness. Upon comparing the epithelia from the different organs seen in urine, those from the uriniferous tubules, the pelvis of the kidney and the bladder, they are found to be different in size at least. Those derived from the ureter have a moderate size and are approximately twice as large in diameter as the pus corpuscles or leucocytes in the same case. It must be remembered that an epithelium is bound to change somewhat in the urine, on account of the imbibition of the watery constituent of the urine, the cuboidal epithelia becoming rounded, oval or even perfectly globular, and a trifle larger than in the tissue. There are no other epithelia in the urine, with the exception of those from the prostate gland, which have twice the diameter of pus corpuscles, those from the convoluted and narrow tubules of the kidney being about one-third larger than the pus corpuscles. The deepest layer of the ureter is lined by columnar epithelia; these also are perfectly characteristic, the more so, since they differ from those derived from the ducts of the prostate gland, and are caudate in character. These caudate epithelia are frequently seen in ureteral catheter specimens, being due to the injury caused by the catheter. In this manner we are enabled to locate a hemorrhage directly in the ureter, or an impacted calculus, a tumor, or a destructive process of any kind.

Dr. Follen Cabot. The cystoscope I prefer for this work is the prismatic or right angle instrument. With this we get a better view of the ureter and can bring first one ureter into view and then the other one with a turn of the wrist. This is done more quickly and easily than can be done with the direct view instrument. In hemorrhage from one kidney, I was deceived a few days ago in my first examination, by the blood coming apparently from the right ureter, but before I could be positive, dimming the whole field. I felt sure one kidney was bleeding. I catheterized both ureters and found that the blood came from the left kidney. Later on I examined the case again, and was able by meatoscopy to determine the point positively. We must be careful about depending too much on this method alone. If we get a clear field in a healthy bladder, thick pus is more easily located. Where the bladder is diseased, it will be much more difficult without the catheter to determine which ureter is involved. In a tuberculous kidney, we usually get an uneveness; also reddening around the opening of the ureter, depending on th stage of the disease. Slight red-

ness and swelling around the opening combined with some suggestion of tuberculous nodules, is frequently seen in these cases. A plain inflammation will sometimes give us nearly the same picture, so we can only decide by catheterization. In hypertrophied prostate or where the ureter is brought into view with difficulty, I use a 4% salt solution of indigo carmine. I inject this subcutaneously to help in determining the opening of the ureter. I have examined several cases where there has been a nephrectomy. The longest period was eight years. The remaining kidney usually has a rather enlarged ureteral opening and much more activity than where both kidneys are present. After observation of the ureteral opening, I have found stricture in several cases an inch or two from the meatus. This may almost be considered typical in tuberculous disease of a kidney. In calculus of the kidney, but more particularly if producing obstruction, as it does when in the ureter, we find by meatoscopy, the golf hole ureteral opening. The sphincter of the ureter in these cases seems paralyzed and remains inactive and patulous. It is quite typical of ureteral stone or of stone in the renal pelvis.

Dr. O'Neil. On account of the high mortality attending ureteral implantation, Dr. Watson of Boston, has suggested that double lumbar nephrostomy be performed to establish permanent renal fistula. At a second operation, the bladder to be removed entirely. This suggestion is based on the fact that he has a patient who a number of years after double nephrostomy is well, and attends to his regular duties. This method although radical, would be of undoubted value in selected cases.

Dr. Valentine. Dr. Fuller said that it is hardly worth while to perfect oneself in both methods of cystoscopy. He was speaking of the direct and indirect methods. I cannot agree with him on purely personal grounds. I would not want to do without both cystoscopes. There are instances where I would fail with the prismatic and make good with the direct one, and the reverse would hold good. It may be due to larger experience with one instrument or maladroitness. I find it necessary to use both methods. Why I fail with one in some instances and succeed with the other, I am unable to say. I have spent as much as five minutes trying to get a catheter in, would then change and succeed at once. The author has also said that for the pain with the patient experiences, there are few people who have used cocaine. His analgetic must be his fingers. When we consider the introduction directly through the urethra, the rotary motion and finally the tilting, we do not discommode the urethra and there is no pain. I would like to ask Dr. Fuller to give us a few words more regarding anodynes in the passing of stones. My reason is that I have failed in all cases in getting any relief from any of the hypnotics. I have been obliged to use an enesthetic to a light degree until the stone was passed.

Dr. E. Fuller. I don't use a great many anodynes. Where a stone is progressing, the surgeon is in the position of the obstetrician where the baby is coming along all right. There may be little to do aside from assuring the patient. I never have pushed a case with anodyne, but I think there have been cases in which the amount of morphine given was so great, that after the stone had passed, death from morphine had to be feared. In extreme conditions, keeping them under an anesthetic is all right. I am not defending anodynes and I yield to Dr. Valentine that they are probably not of much value. I think the actual passage of the catheter in the ureter rarely causes pain. The principal pain caused is introducing the cystoscope into the deep urethra, and in certain cases where you have inflamed conditions, bending the shaft of the instrument has given more pain than anything else. Personall . I use the direct method and am not skillful at the indirect. I think there are few who use both methods.

CYSTOTOMY IN THE FEMALE.[1]

Dr. Edgar Garceau, M. D., Boston, Mass.

THE cases which are amenable to treatment by this operation are the following: (1) Nervous cases; (2) tubercular cases; (3) cases of simple chronic cystitis without infection of the upper urinary passages; (4) cases of chronic cystitis with infection of the upper urinary passages. The treatment varies in each case to a certain degree.

Nervous Cases.—This class comprises cases of hysteria, neurosis, and vesical hyperaemia due to pelvic engorgement. The hysterical cases are very difficult to cure. Every effort should be made to cure them without resorting to so serious an operation as cystotomy, and chief among the therapeutic measures is suggestion. Hysteria is very amenable to this form of treatment, and sometimes a hysterical bladder will yield very readily under its influence. The chief cause of suffering is simply the desire to empty the bladder more frequently than usual. This symptom becomes after a while, a fixed idea, and the patient devotes her whole attention to brooding over this one organ. If all means of treatment fail, there is nothing else to do except to make an artificial opening into the vagina. The relief is instantaneous and the patient has no further trouble and has a chance to get well of her disease. After a time the opening may be closed, but before closing it the patient should be firmly impressed with the idea that there will be no further trouble. It is very difficult sometimes to differentiate between a purely nervous bladder, and one due to a definite lesion, for instance a long standing ureteritis. This latter disease is especially likely to be overlooked because the symptoms and the signs which characterize it are obscure.

The following case is illustrative of hysterical bladder.

Mrs. D., forty years old, was first seen in September, 1895. She had four children, the youngest four years old. She had always enjoyed previous good health.

[1] Read at the Annual Meeting of the American Urological Association, Boston, June 4-5, 1906.

Her vesical trouble began three years previous to her first visit. The complaint was that she had to pass water very often night and day, and there was always a constant desire to empty the bladder. Her history was that of a very nervous woman, who magnified her symptoms unintentionally, in fact she was of a distinctly neurotic type.

On examination the genital organs were not remarkable. With the cystoscope, the whole urethra was found to be much congested, but the bladder itself was normal, except that the trigonum and vesical neck were somewhat red. Examination of the urine showed nothing abnormal with the exception that there was a slight excess of epithelial cells.

She was put upon various sedatives and was told to pay as little attention as possible to her bladder trouble. Locally nitrate of silver was applied to the trigonum and vesical neck, with some relief.

She remained under treatment until November 24, 1895, then she became pregnant. At once all the bladder troubles were redoubled in intensity and relief was imperatively demanded at the end of the second month of pregnancy. So, although she was pregnant, a cystotomy had to be performed in order to relieve her. The operation was perfectly successful and she immediately experienced full relief. She was confined in June, 1896, without trouble, and the fistula in no way interfered with the confinement. She was last heard from in December of the same year, having fallen under the treatment of another physician, and she was then contemplating having the fistula closed.

This case was one of hysteria of the bladder. She had been examined by a neurologist, who reported that her field of vision was nearly down to fixation, and that she had various other stigmata of the disease.

Another form of neurosis is the intensely irritable bladder which is sometimes seen after certain pelvic operations, notably hysterectomy. Here we have pelvic engorgement and this engorgement is general throughout the pelvis, and affects the bladder as well as the rest of the pelvic organs. Simple hyperaemia of itself is enough to cause an irritable bladder, but there is likewise a strong nervous element in these cases. The patient becomes markedly nervous, has hot flashes, is intensely irritable, and if

she has vesical hyperaemia the calls to urinate will be much more frequent. These cases are sometimes very serious in that if they are not relieved the nervous system begins to be undermined, and something has to be done. Cystotomy here offers an immediate and permanent form of relief so long as the opening exists. The patient is immediately made comfortable. But as a curative measure it fails, for as soon as the fistula is closed, if it is closed before the termination of the artificial menopause, at once the symptoms are apt to return with their old intensity.

Mrs. W. was first seen October 25, 1895. She was thirty-three years old and had been married sixteen years. She had five children. After the last child was born she suffered from septicaemia, was in bed six weeks, and had been ill ever since that time. Previous history was negative as well as the family history. She suffered so much from pain in the pelvic region that the uterus and appendages had to be removed for severe inflammation of these organs. The operation was performed by Dr. E. W. Cushing in September, 1895. Immediately after the operation she suffered no more from pain, but there was a frequent, irresistible desire to empty the bladder, which persisted night and day.

On examination a tender cicatrix was found in the vagina on the right side. With the cystoscope it was seen that the urethra, vesical neck, and trigonum were intensely red and granular looking. Soon the symptom incontinence made its appearance, and this, with the constant desire to empty the bladder, made the patient's life miserable. The symptoms of menopause added to the discomfort, and after suffering eight months, during which time she was tormented continually day and night, a vesico-vaginal fistula was made. Complete relief followed at once, and she had no further trouble with the bladder. She was an intensely nervous, excitable, unreasonable woman, and at the end of four months from the time the fistula was made she insisted upon having the opening closed. At no time was there any pus in the urine, the sediment consisting of an excess of epithelial cells only.

The fistula was closed in November, 1896, and at once the old train of symptoms began with redoubled intensity. A peculiarity of her suffering was that at the time when she usually had her menstrual period the vesical irritability was very much more

severe. A gradual improvement appeared in February, 1897, and continued until the end of that year, when she was passing her water only four times a day, and not at all at night. In January, 1898, she had an attack of acute cystitis which lasted several months. Appropriate treatment was given for this and it finally disappeared. She was seen again in June, 1900, and then she reported herself entirely well, and there had been no return of the old symptoms. This case was undoubtedly one of simple vesical hyperaemia with a very large neurotic element. The hyperaemia was due to the increased pelvic congestion, the result of the operation, while the neurotic element came in part from the fact that she was undergoing artificial menopause. The great intensity of vesical symptoms at the usual time of the menstrual period was significant. While the fistula undoubtedly gave the patient a great deal of relief, yet it does not seem that it had much to do with the cure of the trouble, because the symptoms recurred immediately after the fistula was closed.

If the patient is an extremely neurotic woman and has suffered for a good while before the cystotomy has been done, the operation may sometimes fail and the failure here is due to intense spasm of the vaginal outlet which retains the urine in the vagina as it comes from the bladder. In such cases the only thing to do is to incise the vaginal septum from the meatus to the cervical junction, including the vesical neck. No fear need be felt in regard to the efficiency of an operation to close this extensive fistula, for there is no reason why the vesical neck should not heal if a proper operation has been done to close it. In one case in the author's experience the fistula remained open for a period of five years; then the operation for closure was performed with a most excellent result, the patient being able to retain her urine with very little incontinence at first, which soon disappeared.

Tubercular Cases.—Heretofore it has been thought to be unwise to do a vaginal cystotomy in cases of tubercular cystitis for the reason that when the disease has not been cured and an attempt made to close the fistula at the patient's urgent solicitation, the wound has not closed owing to the persistence of the tubercular disease in the bladder which prevents healing in a normal way. But if the tubercular disease has been thoroughly

eradicated from the bladder there is no reason at all why the opening should not close as it usually does. The cure of tubercular cystitis at present is by no means impossible. If the disease has not extended beyond the limits of the bladder, in other words if it has not extended to the ureters and kidneys, there is no reason why, if the case is properly treated, it should not get well. The first essential in the treatment of tubercular cystitis is to be sure therefore that there exists no tubercular inflammation of the passages above the bladder. If such inflammation exists a cystotomy is at best merely palliative. A tubercular kidney or a tubercular ureter should be removed by excision.

Tuberculosis of the bladder may be divided for convenience sake into three classes; (1) the incipient cases; (2) the long standing cases, and (3) the incurable cases.

There seems to have been a dread or at least a disinclination to do the operation, cystotomy, but in view of the immense relief which it gives this is difficult to understand. It is not meant that all cases of tuberculosis of the bladder should be treated by a cystotomy. The usual methods of treatment of the disease should be first tried, including the effects of hygiene and climate, as well as the treatment with corrosive sublimate and nitrate of silver. If this treatment fails, and it is very apt to, relief is demanded imperatively.

Another class of cases deserves mention, and that is cases of disease occurring in poor people who have to earn their own living, and who cannot devote their time to a long course of treatment. These patients can be immediately relieved by this simple operation, and it is particularly in this class that the operation finds its chief place. These patients can go about without pain, they can take the necessary after treatment at home, and above all they are perfectly comfortable and can occupy themselves with whatever they have to do.

It is not well to wait too long before resorting to this operation in any case. If, after a thorough trial of the ordinary method of treatment, it has failed, it is far wiser to proceed at once to a cystotomy rather than take the risk of having the disease extend to the upper passages, as it is very certain to do in time.

The after treatment of the patient who has had a cystotomy

is extremely simple. She takes two copious injections of boracic acid daily, observing strict antiseptic precautions, meanwhile wearing rubber gloves; in this way she keeps her hands free from the contamination with the germs and runs no risk of spreading infection. She has applications of nitrate of silver made to diseased areas of the bladder by her physician at occasional intervals, and she takes the Guyon treatment at home.

The disease will yield after a variable time, depending upon the extent and severity of the lesions. An out-of-door life is to be enjoined, the greatest care of the body taken, and sleeping in the open air is advisable. The rubber urinal which is worn in these cases collects every drop of urine as it drops from the bladder into the vagina, and keeps the patient in a state of cleanliness and dryness.

Miss F. was first seen March 23, 1904. She had always been well with the exception that seven years before she had a uterine displacement which was corrected and afterwards gave no further trouble. Her general health had always been good, and she never had any complaint except that with reference to the bladder. There were no chest symptoms. Two or three years before the first visit she had suffered from attacks of cramps, which were never severe, and lasted only a half hour or so; they were never severe enough to require the services of a physician. The catamenial history was not remarkable. The duration of the bladder trouble was seven years, and during that time she had been obliged to pass her water frequently, especially lately, when urination was necessary as many as thirty or forty times a day, and many times at night. The act of micturition was painless except when she had to retain the water in the bladder any length of time; then she suffered a good deal. There never had been any hematuria, nor was there any incontinence. The chief trouble was constant, irresistible desire to pass water.

On examination the abdomen was found to be quite soft. The urine showed a large amount of pus, many small round cells, a few squamous cells, a few granular casts of small diameter, some of which had blood corpuscles adhering to them, and many tubercle bacilli.

On April 2, 1904, the bladder was examined under ether with the following result: The whole urethra was very much

congested and red, but there were no ulcers. In the bladder, however, there were several ulcers, one on the trigonum, one on the posterior wall, one just behind the left ureteral orifice; they were all small, not more than two centimetres in diameter, somewhat punctate and with yellow bases. Over the left ureteral orifice there were scars which looked as though they represented the remains of an old process. The bladder as a whole held 10 oz. The left ureter after some trouble was catheterized and a catheter was put in it. Although it was left in the ureter for five hours no urine was obtained at all. The Harris instrument was equally unsuccessful. On the right side the urine flowed readily and was not remarkable on examination.

As this patient had to earn her own living from day to day, and had no means of support except through her own individual efforts, it was necessary to do something for her which would enable her to do her work. So, without much hope of doing more than to relieve her condition, and with the supposition at the time, that an artificial opening into the vagina would lead to secondary infection and possibly more serious local conditions than were then present, it was nevertheless determined to make a vesico-vaginal fistula. This was accordingly done.

She left the hospital at the end of two or three weeks, and was instructed in regard to the care of the bladder. She was fitted with a rubber urinal which collected all the urine as it came from the bladder into the vagina, and she was told to take two boracic acid douches a day, using a sterilized catheter. She kept her hands free from contact with the urine with a pair of rubber gloves, which were sterilized from day to day. Besides this she had applications of silver nitrate to the bladder through the cystoscope occasionally.

In July, 1904, she began to use corrosive sublimate herself at home, at first injecting fifteen drops twice a day of 1 to 1000 solution of the corrosive. The strength of the solution was gradually increased until after a few weeks she was using a 1 to 500 solution. This treatment was continued until June, 1905, a period of a whole year. She then had to stop it on account of irritation which the corrosive was causing; but she resumed it again in September of the same year, having occasional applications of the silver as before.

In February, 1906, she having worked every day bookkeeping since her operation, and having followed directions to the letter with the greatest care, she appeared to be entirely well, judging from the entire absence of pus in the urine, and from the absence of any symptom referable to the bladder. On April 16, 1906, the fistula was closed successfully, and she is now undergoing treatment for a contracted bladder which holds now 125 ccm. The disease seems to be cured.

Long-standing cases are particularly amenable to this form of treatment. The essentials required are persistency, patience and care in details. The patient washes out her bladder twice a day with boracic acid solution, she injects the corrosive sublimate drops, and she comes to the physician occasionally to have ulcers treated locally with the nitrate of silver. In case of mixed infection the injection of ichthyol and glycerine in equal parts is of great value. Time must not be considered in the treatment; it sometimes takes a number of years before the last traces of the disease have disappeared, but finally the patient gets well. Of course, cases in which there are serious complications of tuberculosis in other parts of the body will not do well, and some care must be exercised in selecting cases for this method of treatment. If, however, the patient is in a fair condition of health as regards the rest of the body a cure may be looked for.

The following case is illustrative:

The patient was first seen in June, 1896. Her father died of cancer of the stomach. Her mother was living, although of delicate health. She had always been of rather feeble constitution, and there was a scar on her neck, the result of an abscess, probably tubercular, in her early childhood. She was of a very nervous temperament, although well controlled. Lungs were negative. She had complained of a pain in the right kidney region for many years, and as a child could not run and jump about as other children did without having a good deal of pain. She suffered a good deal from this pain and at times it was very severe.

The urinary trouble began about a year before she was first seen. There was frequent micturition night and day, attended with severe pain, and there was a constant desire to empty the bladder. There were periods of intermission, during which she

was fairly comfortable, but at other times the suffering was intolerable.

She was of slight build, pale, and had little strength. With the cystoscope, under ether, the urethra was found to be much injected as well as the vesical neck. The bladder was intensely injected, and contained many red patches, some of which had granular tissue on them, and there was likewise an ulcer of large size in the vicinity of the right ureteral orifice. The ulcer was apparently a typical tubercular ulcer. The right kidney was somewhat enlarged and was tender. The urine was very cloudy and contained a great deal of pus, a few casts, various sized epithelial cells, some blood and many tubercle bacilli. The left ureteral urine was normal but the right was purulent and contained tubercle bacilli, casts and epithelia. Guinea pig tests were positive.

Lumbar nephrectomy was done June 20, 1896, and a kidney, containing a large tubercular abscess, was removed. Convalescence was fairly good, but there was no relief from the suffering from the bladder. The following month she was again etherized and the whole bladder was cauterized with nitrate of silver stick. Great relief followed, and this lasted for several months, during which time she suffered very little from her bladder. In August, 1897, she began to get worse again and she continued to decline until in February, 1898, it was necessary to make an artificial vaginal fistula. This remained open for five years, during which time she suffered no pain whatever, and was perfectly comfortable in every way. The treatment at this time consisted in washing out the bladder carefully twice a day in boracic acid solution, and occasionally making application of strong nitrate of silver solution, to the diseased areas. At times she likewise injected into the bladder a solution of ichthyol and glycerine, which seemed to do a great deal of good. There was no marked improvement, however, until the Guyon treatment was instituted. This had been tried before the fistula was made, but it failed on account of the intense pain. She stood it very well the second time and in eight months the bladder was entirely rid of all evidence of tubercular inflammation. In October, 1904, the fistula was closed with success and she had no further trouble with the bladder. There was some contraction of the bladder but this was expected; it was

dilated by gradual daily dilation so that it soon held six ounces. She is now comfortable and has been well two years.

In cases in which the bladder is incurable, the operation is palliative. Where a bladder reduced to a small capacity holds only an ounce or so, with thick cartilaginous walls, with a mucous membrane studded with ulcers, it is difficult to see how a cure could be expected, no matter with what form of treatment. In such cases the inflammation of the upper urinary passages is almost certain to be present and the most that can be done is to make the patient as comfortable as possible until she dies. Cystotomy, however, will relieve such a patient. The urine which is the source of irritation, drains away through the artificial opening and the pains and intolerable torments cease as soon as the fistula has been made.

Cases of Simple Chronic Cystitis Without Infection of the Upper Urinary Passages.—Here the main question is when to do the operation. At best, a vaginal fistula is uncomfortable, a source of annoyance, chiefly mental, however, and a nuisance. Patients do not like to contemplate the attendant trouble which is sure to come with a cystotomy and then will put it off as long as possible. Chronic cystitis, however, may well spread to the upper urinary passages, and it is not well to wait too long for fear that this may take place. The more virulent forms of the disease are particularly apt to invade the ureter, and among them, stands foremost gonorrheal inflammation. This form of inflammation gives rise to a great deal of suffering proceeding from the bladder, and one would be more apt to do a cystotomy in a case of gonorrheal cystitis than from a cystitis from some other form of infection. When the disease is due to the colon bacillus or to some of the milder germs, it is best to give the patient the benefit of the ordinary treatment for the disease as long as possible before resorting to cystotomy. Many cases will yield and get well in the course of time.

Mrs. P., sixty years old, was first seen in July, 1903. She had always enjoyed good health and her family history was negative. She had never had any trouble whatsoever with the bladder until a year before she was first seen. At that time a rectal polyp was removed, and during the convalescence from this trouble, she contracted cystitis. Since then she was obliged to

pass her water very frequently night and day, the act being attended with some pain and tenesmus. There was no history of renal colic nor of hematuria, nor of incontinence, nor of gravel. She suffered all the time from the constant desire to empty the bladder, but she had periods of temporary relief, during which she did not suffer quite so much.

On examination of the urine, the sediment was found to be made up of pus chiefly, numerous squamous, small round epithelial cells and a few blood corpuscles. Guinea pig tests were negative.

She was a large, stout woman, of robust constitution and nervous temperament. The perineum was lacerated and the uterus atrophied. Kidneys and ureters were negative. The urethra was very red and granular and the whole bladder intensely injected and contained numerous red patches, three or four centimeters in diameter, the patches being made up of granular tissue which bled very easily. There were no ulcers.

As she had been suffering for a long time and had had the benefit of the usual forms of treatment of this class of cases, a cystotomy was advised. The after treatment consisted of douches of boracic acid, and occasional applications of mild solution of nitrate of silver, and urotropin internally. The fistula remained open for two years, during which time she took the greatest care of herself. It was closed in January, 1905, and since that time she has been perfectly well.

Mrs. P., was seen April 11, 1897. She was a woman of forty-eight years, married, and her previous history was not remarkable with the exception that for many years she had suffered from a medium-sized fibroid tumor of the uterus. This had never given her very much trouble, and had been kept in check by the use of electricity.

Her urinary history began four weeks before she was first seen. The onset was sudden and the first symptom was frequent, painful micturition, increasing in severity and in frequency, until finally she was urinating every few minutes with the greatest agony. After a week or two, the number of urinations was reduced somewhat. But she suffered so much pain during and after the act of micturition, that relief was imperative. On examination under ether, the meatus was found patulous and the

mucous membrane which had been forced out by the enlargement of the lining of the canal behind. On pressing the urethra vaginally, yellow pus could be expressed from the meatus. Half way up the urethra there was an ulcer of small size, with a grayish base and two smaller ones at the neck of the bladder. The whole bladder was very much inflamed and the membrane was red, swollen and glistening. The case was evidently one of very acute cystitis, due to virulent infection, and, judging from the severity of the symptoms, seemed to be gonorrheal, which view was strengthened by finding Bartholini's gland on the right side enlarged. On pressing this gland, pus could be squeezed from its opening.

As the patient was suffering intense agony and demanded relief, a cystotomy was proposed and accepted. The operation was performed April 13, 1897.

Mild antiseptics were used as a bladder wash, and internally she took sedatives. There was a gradual allaying of the inflammation and the redness began to disappear.

In November, 1897, the bladder wall prolapsed into the fistula, having been pushed down doubtless by the pressure of the large tumor above.

This prolapse of a part of the bladder immediately above the fistula, finally became so pronounced that it threatened to be a serious complication, and forced an earlier closing of the fistula than would otherwise have been done. At the operation for closure, which was in March, 1898, the polyp was excised and the fistula closed. In June, 1898, she was very much better, was urinating every three hours by day and twice by night, without pain. There was still some vesical irritability and a little incontinence. This lasted for a few months and finally disappeared entirely and the patient was well and has remained so since then.

Cases of Cystitis (non-tubercular) with Infection of the Upper Urinary Passages.—Numerous diseases of the upper passages may be associated with cystitis; chief among them are ureteritis, strictured ureter with dilatation of the upper passages, pyelonephritis and calculous disease of the kidneys and ureter.

The cure of the disease of the upper passages goes a great way towards eradicating a cystitis, but there are many patients who will not submit to a serious kidney operation. In such cases

a cystotomy relieves the patient from her suffering in a great measure, and if the opening is allowed to remain, the kidney will, in same cases at least, atrophy, and then the fistula may be closed. The following are illustrative cases:

Mrs. M., was first seen September 28, 1898. She was a thin, spare woman, thirty-five years old and had been married seventeen years. There was a history of phthisis in the family, her brother having died of the disease. The family history was negative.

There had been a gradual loss of strength and flesh until she was finally reduced to a state of great exhaustion.

She suffered somewhat from headaches, dizziness, constipation, and she never had a good appetite. She had had one child during the first year of her married life.

The urinary disease began eighteen years before she was first seen. It was ushered in by a severe pain in the right kidney region, the pain radiating down the course of the ureter on that side. It was agonizing in character and required a large amount of morphine for its control; it lasted a week and was of such severity that the patient was unconscious half the time. The attack gradually subsided and she was well for a few months, at the end of which time there was another attack of renal colic, and this was succeeded by others which came on with more or less frequency for many years, and always in the right kidney region.

Frequency of micturition as a symptom began four years after the beginning of the disease and was a source of constant, harassing annoyance ever since then.

Sleep was disturbed and she never knew what it was to have a good night's rest. Urination averaged 10 or 20 times a day and 10 times at night.

In 1891 a vesical calculus was removed by Dr. J. R. Chadwick. This relieved her for a while, but a year later the cystitis had again become so troublesome that it was necessary to do a cystotomy for its relief. She endured the inconvenience and discomfort of this fistula for two or three years, and then decided that she preferred to suffer from the cystitis. Two or three attempts were then made by different physicians to close the wound, but they were unsuccessful.

When she was first examined in September, 1898, two small

fistulae were seen in the vagina just behind the vesical neck. With the cystoscope, the bladder was very red and there were two excavated ulcers at the side of the left ureteral orifice. The right ureteral eminence was normal in all respects.

The bladder urine contained a large amount of pus, free and in clumps, some blood, a few granular casts of small diameter and numerous bacteria. The right ureteral urine contained a very large amount of pus, a little blood, a few hyaline granular casts and a few epithelia of various sizes. The left ureteral urine contained a few casts but was otherwise negative. The urea percentage on the right side was .5%, while on the left side it was 1.1%. Guinea pig tests were negative.

Both kidneys were carefully palpated at this examination, with negative result, and this seemed quite remarkable in view of the fact that it contained stone, as was afterwards proved on operation.

The fistula was sewed up and the operation was successful. In January, 1899, she began to have a good deal of pain in the right hypochondriac region and a tumor appeared. She declined any operative interference and remained in this state until July, 1902, suffering more or less pain all the time.

At this time, while riding in an open car, the motorman was obliged to stop suddenly in order to avoid running over a child. The passengers were severely shaken up by the sudden stopping of the car, and the patient received a severe jolting which resulted in bursting the fistula, the bladder, unfortunately, having been full at the time.

On examination, a small fistula in the vagina was found occupying a portion of the old cicatrix. The right kidney region was very tender and sensitive on pressure, and the pain since the car accident, had been very much more severe than it had been previously. An X-ray picture was taken about this time with a positive result, shadows of stones in the kidney appearing clearly on the photographic plate. The patient declined to entertain the idea of nephrectomy at this time, and asked only to have the fistula closed. An attempt was made to close it therefore, but it failed entirely. In December, 1903, she was suffering so much from her kidney, that she finally consented to a nephrotomy. This operation was accordingly performed, and two large stones were

removed from the renal parenchyma. Great relief followed. In March, 1904, she came to the hospital, determined this time to undergo nephrectomy to remove the disorganized kidney, as a preliminary in attempt at closure of the fistula. It was found, however, that the left kidney had become diseased by this time, and on examination of the separate urines, pus was found coming from both kidneys. On applying the cryoscopic tests to the blood, a freezing point of .61 centigrade below zero was obtained. With this high freezing point it was thought better not to attempt nephrectomy.

Mrs. C. F. B., aged thirty-five years, was seen in September, 1898. She was a strong woman of rather nervous temperament, but under good control. There was a history of rheumatism and of rheumatic iritis. Symptoms on the part of the bladder had been of two years' duration. Frequent micturition attended with pain were the first symptoms noted. Desire to empty the bladder was constant, and urination was necessary every hour of the night and day. The general health was excellent.

On examination, some sensitiveness was discovered over the course of the left ureter at the pelvic brim and vaginally pressure over the same ureter was sensitive. On cystocopic examination the urethra and whole bladder were generally injected, especially the left hemisphere, and particularly about the left ureteral orifice. The left ureteral eminence was covered and apparently obliterated by cicatricial tissue; its orifice was not seen, and the ureter was not catheterized at this examination. At a subsequent examination the left ureter was entered and a tight stricture discovered about six centimeters from the ureteral orifice. Immediately on passing the stricture, there flowed from the catheter eighteen cubic centimeters of purulent urine. The right ureteral urine was not remarkable and showed a urea percentage of 1.77%. The left ureteral urine showed a urea percentage of .63%. It was of a pale, turbid color, containing trace of albumen and a sediment considerable in amount, consisting of pus, some medium-sized epithelia, a few round cells and granular detritis. No tubercle bacilli were found. Guinea pig tests were negative.

As the patient refused any serious operation, an artificial vesico-vaginal fistula was made. Complete relief followed, and this lasted uninterruptedly until August, 1899. At that time she

had an attack of renal colic on the left side and passed a large amount of gravel and a small stone. This was the only stone that was ever passed. In March, 1904, there was a good deal of vaginal irritation and on examination, it was seen that the edges of the fistula were eroded and that the bladder wall immediately surrounding the fistula opening had prolapsed into the vagina. An attempt was made to cause reduction by applying various astringents, but this was not successful, and in July, 1904, the redundant tissue was pared off. Another unusual phenomenon was the dropping into the vaginal opening of parts of the bladder immediately above the fistula, and they presented in the vagina as small stalactite-looking bodies with rounded tips. This peculiarity of prolapse of the membrane is observed only in people past middle age and is due undoubtedly to the laxity of the tissues. The relief gained by this operation was immediate and she remained quite comfortable until April, 1903, when the same condition recurred and it was necessary to pare the edges of the fistula again.

The relief from the second operation was of short duration, and in October, 1905, there were signs that the bladder was again coming down. As a third operation did not seem to be a wise thing to do, on account of the removel of so much bladder tissue on the two previous operations, although cystitis was not entirely well, it was thought best, in view of the fact that the left kidney had given no symptoms for a long time, to risk closing the fistula. Unfortunately the attempt to close the fistula failed and she is still in the same condition. The left kidney appears to be inactive at the present time.

Technique of the Vaginal Operation.—Kelly's method. (*Am. Jour. of Obstetrics and Diseases of Women and Children,* Jan. 1903, page 28), consists in putting the patient in the knee-breast position, opening the vagina with a speculum and incising the vesico-vaginal septum with a knife directly into the air-distended bladder. This method has certain advantages, in that it allows the surgeon to explore all parts of the bladder with the greatest ease. The membrane can be picked up with a pair of forceps and brought directly into the wound; ulcers can be curetted, small polypi can be removed, or any other operation upon the bladder wall may be performed with great ease. There is an artificial

anemia of the parts around the cystotomy wound, and bleeding, if it does occur, is not embarrassing because the blood drops to the fundus of the bladder from which place it can be easily removed at the end of the operation.

An ordinary case, however, may well be operated upon in the dorsal position, and it is applicable to most cases. Great care should be taken to begin the incision just behind the vesical sphincter, because if the opening is made too far back a small pocket sometimes forms between the vesical neck and the anterior angle of the fistula, and this pocket may serve as a reservoir for the collection of a small amount of urine which may become stagnant and lead to the multiplication of germs, and so to an indefinite continuance of the cystitis. An easy way to incise the bladder is to introduce a director into the meatus, push it as far back as necessary and cut down upon its grooved surface. It is not necessary to make too large a hole, and in fact it is better not to, because if too large the bladder membrane is very apt to fall through into the vagina and be subject to the constant friction of the vaginal walls, and subsequently ulcers may form. An opening not more than 1½ inches in length is sufficient. The edges of the open wound on either side are sewed together by interrupted sutures in such a way that the vesical and the vaginal mucous membrane are brought in contact. The best suture material is a fairly fine catgut, and it is not necessary that this should be chromicized, because it is better that it should not remain *in situ* too long for fear of collection of phosphatic salts upon the sutures.

At the same time that the operation is done, the bladder may be thoroughly explored; ulcers may be curetted or may be treated with the nitrate of silver stick; small polypi may be removed, or in fact any small minor operations may be done through the fistulus opening.

The after-treatment of the case is very simple. The nurse introduces a catheter into the urethra and gives a copious injection of warm boracic acid solution twice a day. These douches are very comfortable and are well borne. The patient stays in bed a week or ten days and then gets up gradually. Large doses of urotropin should be given for a week or two before the operation and for a long time after it has been done.

Convalescence is complete in two weeks. The patient may

then resume her usual occupation and suffer no longer from her bladder in any particular. She, herself, administers the boracic acid solution twice a day under strict aseptic precautions. At the same time she takes the greatest care of herself in regard to matter of daily life, has long hours of sleep, good food, and above all has an abundance of fresh air; hard work should be avoided, especially the kind involving lifting or straining. The fistula from now on should receive close attention, and should be examined at short intervals. The greatest cleanliness is to be observed and the utmost care taken not to introduce a new germ into the bladder and so complicate the infection.

When the fistula has lost all its tenderness, it is time to fit a urinal. If the urinal is not worn, there is a great deal of discomfort from the constant flowing of the urine over the body, necessitating frequent changes of dressings, and this can entirely be avoided by wearing one of these urinals.

The best kind of urinal consists of a simple rubber cup-shaped receptacle which fits into the vagina, and is fitted for each special case from a model, the dimensions of which are easily obtained by the surgeon. At its lower end is a small rubber tube which leads to a rubber reservoir and fastened to the thigh by an appropriate band. This urinal should be carefully cleansed every day, and it is essential that the vaginal portion of it should be thoroughly boiled each day. If the vaginal portion fits well, there will be no discomfort whatever.

Complications after Cystotomy.—The most frequent complication immediately after the operation has been performed, is the deposit of phosphates on the edges of the fistula, especially about the free ends of the sutures; if chromicized catgut has been used, these phosphates are much more apt to occur. They present as whitish masses on the edges of the fistula and of course irritate the membrane below to a great extent, causing a feeling of irritation and soreness which are more marked when the patient walks about or makes any movement. They are easily removed with a dressing forceps, and when removed, the base should be immediately cauterized with pure nitrate of silver. Several douches a day of boracic acid solution will usually prevent their occurrence. An occasional application of pure ichthyol sometimes hastens their healing.

Ulcerations of the edges of the fistula are quite frequently

seen. These may be due to improper care and to want of cleanliness on the part of the patient. On the other hand, in spite of the greatest care, they sometimes occur, and then they are probably due to the constant friction of the vagina below upon the delicate, and as yet unhealed edges of the fresh wound. They are also sometimes due to the friction of the rubber urinal, and it may be necessary to omit wearing it for a little while until the ulcers have a chance to heal. If they are not attended to at once, they sometimes spread to the vaginal wall, even as far as the cervix, and when they are as extensive as this, may cause a great deal of suffering. There is a constant irritation, pain, and discomfort. The treatment of these ulcers is cauterization with nitrate of silver, copious vaginal douches, frequently repeated, occasional applications of ichthyol, or aristol, and it may be necessary for a few days to confine the patient to bed until healing has begun.

Contact ulcers affecting the part of the bladder mucous membrane directly over the fistula are sometimes seen; they are caused by the friction of the vaginal wall or the rubber urinal below. They may be difficult to heal because of the constant presence of the cause. If extensive, rest in bed for a few days will promote healing processes. These contact ulcers are sometimes very obstinate and may last a good while, and even when it is time to close the fistula, it is not uncommon to find the bladder immediately above the opening red, congested and angry-looking.

Granulations of the edge of the fistula are of infrequent occurrence. They sometimes present as a rosy bunch of tissue occasionally with a pedicle, sometimes without. The best way to treat them is to excise them and burn their bases with nitrate of silver.

Prolapse of the bladder wall into the vagina through the fistula, is an occasional complication. There are two forms, first the prolapse of the edges, and second, prolapse of the summit of the bladder. There are three causes for this prolapse. In the first place they are rarely seen in women below thirty years of age, and they are more apt to occur in women past middle life; the cause here is laxity of the tissues. In a young person a fistula may be open many years without having this complication. The second cause for the prolapse is the pressure of the

tumor, for instance a fibroid of the uterus; as a result of this pressure, the bladder wall is forced into the fistulous opening and may present in the vagina as a little pedunculated tumor with a round tip. Finally, a lacerated perineum with a co-existing tendency to prolapse of the pelvic contents is usually attended with prolapse of the mucous membrane. In such a case it is essential that the perineum should be repaired before doing the cystotomy.

When the prolapse is confined to the edge of the fistula, the condition seen is that of eversion of the bladder mucous membrane into the vaginal vault. These edges readily become ulcerated and sore, bleed easily, are tender to the touch, and they give rise to a great deal of irritation, especially on walking or on exertion of any kind.

When the summit of the bladder prolapses into the vagina, it does so in the form of stalactites with rounded tips presenting small ulcerations at the tips. These stalactites may be one or several.

When this condition of prolapse is caused by a tumor pressing down from above, a real difficulty may be experienced, and it may lead to the closure of the fistula sooner than was contemplated.

The treatment of everted edges is an attempt to heal the ulcers with nitrate of silver, applications of ichthyol or aristol and avoidance of excision of the edges as long as possible. If, however, on account of their intractable nature, it is impossible to heal them, they must be excised.

When this complication has happened once, it is very apt to happen again, because the same cause exists, and it may be necessary to close the fistula before it is time to do so. The reason for this is, that if the operation of paring the fistula is done too many times, it will be at the sacrifice of additional mucous membrane of the bladder each time. The consequence will be that too large an amount of bladder tissue is sacrificed and there is danger of involving the ureteral orifices.

Stalactites may be excised with little danger of cutting through the whole wall of the bladder, as it is usually only the mucous membrane of the bladder and the parts immediately underneath it that are involved.

Hypertrophy of the vaginal walls about the fistula is sometimes seen. In this event the tissues of the septum as a whole

enlarge, and the cause of this enlargement is undoubtedly irritation caused by friction. The hypertrophied walls present as two little puffy rolls, one on each side. They are different from the rolls caused by prolapse of the bladder walls, and the difference is easily recognized. In the first place, prolapse of the bladder wall is found only past middle life. The color, presence of small ulcerations, and excessive tenderness, readily serve to differentiate the two. There may be some embarrassment caused by these rolls at the operation for closing the fistula, and some skill may be required in bringing the parts in close apposition, when the sutures are introduced.

A very infrequent complication of a cystotomy is retroversion of the uterus. This may be caused by contraction of the fistula, especially if the fistula has been made with a Paquelin cautery. Contraction after the use of the cautery is sometimes very marked. Then it leads to a great deal of secondary inflammation, sloughing and ulceration. Subsequently the tissues contract and the tendency is to pull the cervix forwards, which of course tips the fundus of the uterus backwards. The Paquelin cautery method should be condemned and the method of incision and sewing the edges of the fistula, in doing the cystotomy, is the one greatly to be preferred.

Closure of the Fistula.—If there is no pus in the urine and the mucous membrane appears to be clean, there is no question as to the advisability of closing the opening. It so happens that these cases are not infrequently complicated with a condition of phosphaturia; this has been observed numerous times. It is necessary, therefore, that urine, which is brought for examination, should be tested for the presence of phosphates, and it may be found that a cloudiness is due to precipitation of phosphates alone and not to pus. The fistula may have to remain open for one, two, or several years, depending upon the severity of the bladder inflammation. The tubercular cases are the most intractable as a rule, and in this class of cases particularly, it is necessary that every trace of the disease should be gone before closure is counseled.

The operation of closure is a very simple one. The only precaution is not to involve the ureter in the stitches. Preliminary examination of the bladder in order to determine the position

of the ureteral openings is essential, and if they are near the edges it is best to insert a small ureteral catheter into each one so that there may be a guide during the operation. The edges of the fistula are pared with scissors down to and not including the mucous membrane of the bladder, and sutures of silver wire or catgut are taken one centimeter apart, including the tissues, down to the edge of the bladder mucous membrane. The greatest care must be taken not to tie the sutures too tightly, for if they are so tied, the swelling of the tissues, subsequent to the operation, may pull through and lead to the formation of a small sinus into the bladder and so defeat the operation. Before putting the patient to bed, it is well to test the bladder by injecting some fluid into it. If the operation has been properly performed, the bladder ought to be water tight. The operation is completed by putting a bit of iodoform gauze into the vagina, which is changed daily. It is best that the bladder should be drained for the first twenty-four hours, and for this purpose a catheter with a large bore is the best one because it does not favor the formation of clots within it. It may be held in the bladder by means of rubber strips which are fastened to the thigh and pubis. During the first twenty-four hours morphia should be given in large doses. This is to keep the patient absolutely quiet in order to allow of the first union which takes place during the first hours after the operation. The catheter, draining the bladder as it does, also tends in the same direction. There may be a little leakage around the sides of the catheter at first, and this should not be interpreted as failure of the operation; it is simply due to the fact that the sphincter has become tired out and has relaxed, allowing the urine to flow around the sides of the catheter. After the catheter has been removed, the patient should be instructed to empty the bladder as often as she feels any desire to do so, and it is best that she should have a small porcelain urinal at her hand every moment of the time, so that she shall not have to wait for necessary attendance. Neglect to empty the bladder when needed has frequently resulted in failure of the operation. The bladder should be washed out twice a day, very gently with warm boracic acid solution, injecting a very small quantity each time. The best way to do this is to use a small glass syringe and catheter, for in this way pressure may be regulated much better than it can be with

a fountain syringe and there is much less danger of doing harm. As soon as the ether vomiting has ceased, the patient drinks plenty of water and milk, the bowels are regulated and she is careful in the selection of a diet. There is a good deal of irritation of the bladder after the operation, but this need not cause any alarm; it is simply due to increased congestion as a result of the operation and the irritation caused by the suture. It subsides in a few days.

The sutures are removed on the tenth or twelfth day, and the patient gets up in about two weeks.

It is by close attention to the many little details that success will be obtained. The greatest care in regard to asepsis is of chief importance, and it is better that the treatment immediately after operation should be given by the surgeon himself, rather than trust it to a nurse. If a ureter has been sewed in, symptoms on the part of the kidney will attract attention and require the removal of the sutures. The operation of course fails and will have to be done again. If the operation is to be a success there will be no leakage from the vagina at all, but if it is a failure, notice is given at once by vaginal dribbling. This is seen even if there is a very small hole; all the urine comes through it as it gradually leaks away. It does not mean that the operation is a complete failure, if the hole is a very small one, for if the patient is kept very quiet, sometimes nitrate of silver fused on the end of a probe and carefully applied to the fistula, will occasionally produce enough irritation to start up granulation and result in healing. Under no circumstances must a second operation be attempted immediately after the first one. The patient must have time to recuperate in the fresh air under favorable conditions. If the surgeon yields to the urgent solicitation of his patient to attempt a second operation, he must be prepared for failure, because the tissues will not heal well after the body has been through such a strain as that caused by prolonged stay in bed.

The contraction of the bladder subsequent to long disease, sometimes reduces its capacity so that it will hold only a small amount. This is not a serious difficulty, for by daily distention of the bladder with a syringe, under pressure, it can soon be brought up to a normal or nearly normal capacity.

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